

Zarif Sharifovich Tadjibaev, PhD

**WORLD'S FIRST**

**IDEAL SEWING TECHNOLOGY**

**ZARIF 2025**

**BASED ON A ROTATING LOOPER**

**THE KEY MISSING LINK  
IN THE CREATION OF THE  
AUTONOMOUS, UNSTAFFED  
SEWING FACILITIES OF THE FUTURE**

A fundamental analysis of the  
irremediable limitations of  
19th-century sewing technologies



**ZARIF 2025 PLATFORM**

Ideal sewing technology ZARIF 2025 + AI + Humanoid robots + Autonomous robotic carts

Ph.D. (Engineering) ZARIF SHARIFOVICH TADJIBAEV

## THE WORLD'S FIRST IDEAL SEWING TECHNOLOGY ZARIF 2025 BASED ON THE ROTARY LOOPER

### ***THE KEY MISSING LINK IN CREATING AUTONOMOUS SEWING FACTORIES OF THE FUTURE WITHOUT HUMAN PARTICIPATION***

#### ZARIF 2025 PLATFORM

 ZARIF 2025 Ideal Sewing Technology |  Humanoid Robots  
 Artificial Intelligence |  Autonomous Robotic Trolleys

*The foundation of the future automated sewing factory without personnel*

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### **TABLE OF CONTENTS**

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ABOUT THIS BOOK · INTRODUCTION

PART I. THE THREAD — THE FOUNDATION OF INDUSTRY

Chapter 1. The History of Sewing Thread: From Sinew to Nanofibres

Chapter 2. Types of Sewing Thread and Their Role in Automation

Chapter 3. Why Threadless Methods Cannot Replace Thread

Chapter 4. The Thread Seam: Why the Single-Line Stitch Is the Absolute Leader

PART II. 170 YEARS OF IMPERFECTION

Chapter 5. The Bobbin Curse: All Defects of the Lockstitch (Type 301)

Chapter 6. The Four Vices of the Double Thread Chain Stitch (Type 401)

Chapter 7. The Digital Façade: Juki, Brother, Jack and Their Powerlessness

Chapter 8. The Price of Illusion: \$10 Billion in Annual Losses

Chapter 9. The Graveyard of Hope: Automation Failures

PART III. THE ZARIF 2025 REVOLUTION

Chapter 10. The Forgotten Genius: James Gibbs and the Rotary Looper

Chapter 11. The Birth of an Idea: Tashkent, 1994

**Chapter 12. An Engineering Chronicle: 28 Years of Prototype Evolution (new)**

Chapter 13. Four Innovations That Changed Everything

Chapter 14. 13 Phases of Ideal Interlooping

Chapter 15. Ten Revolutionary Breakthroughs of ZARIF 2025

Chapter 16. Tested by Reality: 10 Prototype Tests

Chapter 17. Six Criteria of the Ideal Sewing Technology

#### PART IV. THE AUTONOMOUS MANUFACTURING PLATFORM

Chapter 18. Physical AI: The Brain and Nervous System of the Factory of the Future

Chapter 19. The ZARIF Smart Presser Foot: The Machine's Sensory Nervous System

**Chapter 20. Architecture of the Industrial Version of ZARIF 2025 (new)**

Chapter 21. Humanoid Robots on the ZARIF 2025 Platform

Chapter 22. ZARIF Robotic Trolley: The Circulatory System of the Factory

Chapter 23. Architecture of the ZARIF Autonomous Factory

#### PART V. THE MACHINES OF THE FUTURE

Chapter 24. Types of ZARIF 2025 Industrial Machines

Chapter 25. Pattern Automats with 360° Circular Sewing Mechanism

Chapter 26. Development Roadmap: 2026–2035

#### PART VI. ECONOMICS AND STRATEGY

Chapter 27. Comparative Analysis: ZARIF 2025 vs Traditional Technologies

Chapter 28. Economics of the Autonomous Factory: ROI in 11 Months

Chapter 29. Commercialisation Strategy and Intellectual Property

Chapter 30. A \$400–900 Billion Market Opportunity

#### PART VII. THE WINDOW OF OPPORTUNITY 2026–2030

Chapter 31. First Markets Where ZARIF 2025 Delivers Maximum Impact

Chapter 32. Physical AI 2025–2026: Why Now

**Chapter 33. Technical Challenges Without Parallel (new)**

Chapter 34. Architecture of the First Autonomous Sewing Cell

Chapter 35. Key Sceptic Objections and Engineering Answers

Chapter 36. Documentary Foundation of the 2026 Edition

CONCLUSION · AFTERWORD · ABOUT THE AUTHOR · GLOSSARY · APPENDICES

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## ABOUT THIS BOOK

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**This is the fourth book in the series "ZARIF 2025 — The Platform for Autonomous Sewing Production".** It brings together everything: the history of sewing thread and its role in civilisation, an analysis of the fundamental shortcomings of nineteenth-century technologies, a detailed description of a revolutionary invention, and — most importantly — the architecture of the world's first genuinely autonomous sewing factory.

This book answers a question that has been troubling engineers, investors, and sewing enterprise managers for several decades now: **why, with all the power of modern robotics and artificial intelligence at our disposal, does the sewing workshop remain a zone of manual labour?**

### ◆ ZARIF 2025 — A PARADIGM SHIFT

ZARIF 2025 is not an improvement upon existing technology. It is a paradigm shift. It is the missing link between humanoid robots and fully autonomous sewing production.

## WHO THIS BOOK IS FOR

This book is written for engineers and technologists in the sewing industry, managers of manufacturing enterprises, investors in industrial automation, humanoid robot developers, researchers in the field of Physical AI and machine vision, and for all those who wish to understand what the industry of tomorrow will look like.

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## INTRODUCTION

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### THREE REVOLUTIONS THAT HAVE FINALLY CONVERGED

We stand on the threshold of an event the like of which has not occurred since the Industrial Revolution of the nineteenth century. Yet this time, the revolution is not taking place in England, nor on its looms. It is happening simultaneously in the laboratories of Silicon Valley, Shanghai, and Boston — and in the workshop of an inventor in Tashkent.

#### **The First Revolution: Humanoid Robots Have Become Reality**

The year 2026 is the year in which robots cease to be laboratory exhibits and step onto production lines. Tesla Optimus is learning to sort battery components. Figure 02 is unloading lorries. Boston Dynamics Atlas is demonstrating extraordinary feats of balance and dexterity. Unitree H1 is entering commercial sale. Investment in this sector runs into tens of billions of dollars — in the first half of 2025 alone, it reached \$7.3 billion.

#### **The Second Revolution: Artificial Intelligence Has Acquired a Body**

Physical AI and models such as NVIDIA DreamDojo have enabled neural networks to understand the physics of the real world. AI can now predict how a deformable material will behave, how thread tension will change with a shift in speed, and can train a robot in these skills by observing human workers. DreamDojo was trained on 44,000 hours of egocentric video recordings — fifteen times greater in duration than previous datasets.

#### **The Third Revolution: Rethinking the Sewing Process Itself**

In 1994, in Tashkent, mechanical engineer Zarif Tadjibaev posed a question that had gone unanswered for 137 years: "Is it possible to create a double thread chain stitch that combines the reliability and appearance of the lockstitch with the continuity of the chain stitch, yet requires neither a bobbin nor an Eye-Looper?" Finding the answer required 28 years of work and the creation of ZARIF 2025 technology.

#### **THE PARADOX OF OUR TIME**

The most sophisticated humanoid robot, placed at the most advanced sewing machine, finds itself helpless. Why? Because inside that machine there still operates a mechanism invented in the 1850s. ZARIF 2025 resolves this paradox.

#### **Three proofs offered by this book:**

- Traditional technologies (Type 301 and Type 401) have fundamental defects encoded in their very DNA — defects that no AI can correct.
- The only path to a fully autonomous 24/7 factory lies through the creation of a fundamentally new stitch mechanics.

- ZARIF 2025 technology represents precisely this new mechanics — it eliminates the "bottleneck" of automation and transforms the sewing machine into a digitally controllable module, no different from a 3D printer or a CNC machine tool.

## ✓ WELCOME TO THE ZARIF 2025 FACTORY OF THE FUTURE

### PART I

## THE THREAD — THE FOUNDATION OF INDUSTRY

*From primitive sinew to nanofibres and smart textiles*

### CHAPTER 1. THE HISTORY OF SEWING THREAD: FROM SINEW TO NANOFIBRES

Before immersing ourselves in the complex world of sewing machines and revolutionary technologies, let us speak of the most important element — that without which no seam is possible. Let us speak of thread. Thread is not merely a consumable material. It is the soul of every sewn article and the foundation of all textile civilisation.

#### 1.1. Primitive Times: Survival Dictated the Rules

The history of thread began long before the first civilisations appeared. In the Neolithic era, the first "threads" were sinew, veins, and intestines of animals — strong, elastic, and always available. Sinew was split into thin fibres which, upon drying, became stiff yet retained remarkable tensile strength. Needles were made of bone or horn, carefully sharpened on stones. In the Dzudzuana cave in Georgia, linen fibres dating back 36,000 years have been found, while the Indus Valley (in the territory of present-day Pakistan) has yielded cotton threads more than 7,000 years old.

#### ◆ INTERESTING FACT

Some peoples of the Far North still use reindeer sinew to sew traditional garments — Nenets craftswomen insist that such thread outlasts any synthetic material and does not abrade fur.

#### 1.2. A Chronology of Key Events in the History of Thread

Era	Event
36,000 BC	First linen fibres (Dzudzuana cave, Georgia)
7,000 BC	Cotton threads (Indus Valley)
2,700 BC	Silk (China) — a millennium of secrets
1764	Hargreaves' spinning jenny — a revolution in spinning
1830	Thimonnier — the first practical sewing machine (chain stitch)
1846	Howe — patent for the lockstitch (Type 301)
1857	Gibbs — patent for the rotary looper

1935–1950	Nylon and polyester — the synthetic fibre revolution
1994	Tadjibaev — invention of the double thread stitch on a rotary looper
2025	ZARIF 2025 — the first ideal technology for the humanoid era

### 1.3. The Twenty-First Century: The Era of High-Technology Threads

Today, sewing thread is a high-technology product engineered to micron-level precision. Modern threads combine functionality with innovation:

- **Electrically conductive threads** — for "smart clothing" and e-Textiles. The global electronic textile (e-textile) market was valued at \$8.4 billion in 2025 and continues to grow at a rate of 22 per cent per year. Brazilian scientists transformed ordinary cotton thread into an electrically conductive material by coating it with carbon nanotubes. Swedish researchers at Chalmers University created a silk thread with a conductive plastic coating capable of turning clothing into an electricity generator.
- **Water-soluble threads** — for temporary fixing during assembly. In 2025, a Belgian start-up launched a technology for self-dissolving threads that disappear under the action of heat, revolutionising "transformable" garment design.
- **Aramid fibres (Nomex, Kevlar)** — withstanding temperatures up to 800°C for firefighters' protective clothing.
- **Threads with silver fibres** — for antibacterial medical textiles.
- **Nanofibres and threads with carbon nanotubes** — the materials of the future.
- **Liquid-metal microfibres** — a new class of stretchable conductive fibres for precision sewing in smart textiles, developed in 2024.

The evolution of thread has traced a path from primitive sinew to high-technology fibres — yet one thing has remained constant: the principle of joining materials through thread. This is precisely why thread is not the past. Thread is the foundation of an autonomous future.

## CHAPTER 2. TYPES OF SEWING THREAD AND THEIR ROLE IN AUTOMATION

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The correct choice of thread is half the success of any sewn article. Fibre type, construction, count — all of these directly affect seam quality, machine reliability, and the possibility of automating the process. In the era of transition to autonomous production, the requirements placed upon thread increase many times over.

### 2.1. Classification by Fibre Composition

**Natural threads.** Cotton threads are a classic of the genre. They are produced from combed cotton yarn. They are eco-friendly, hygroscopic, and tolerant of high temperatures. Silk threads are luxurious, smooth, beautifully lustrous, highly resilient, and strong. Linen threads are strong, stiff, with a matt sheen, and are used in footwear and accessories manufacturing.

**Synthetic threads — the absolute leaders of modern production.** Polyester threads (polyester, lavsan) are the undisputed market leaders: high tensile and abrasion strength, low shrinkage, resistance to light and moisture. Polyamide threads (capron, nylon) are even stronger in tension, elastic, and ideal for footwear, bags, and workwear.

**Composite (core-spun) threads.** The core is composed of polyester fibres, with an outer wrapping of cotton (polyester-cotton) or polyester. They provide high strength and excellent seam behaviour. Special types include monofilament, metallic, elastic, heat-resistant aramid, and conductive threads for "smart clothing".